Human Obesity
Reprinted from Vol. 499
ANNALS OF THE NEW YORK ACADEMY OF SCIENCES

An Anthropological Perspective on Obesity

PETER J. BROWN AND MELVIN KONNER

Department of Anthropology
Emory University
Atlanta, Georgia 30322

An anthropological approach to human obesity involves both an evolutionary and a cross-cultural dimension. That is, it attempts to understand how the human predisposition to obesity so evident in modern affluent societies may have been determined during our species' long evolutionary history as hunters and gatherers, as well as the variation in obesity prevalence in different societies, social classes, or ethnic groups.

The evolutionary success of *Homo sapiens* is best understood by reference to the operation of natural selection on our dual system of inheritance; that is, on genes and culture, but also, and perhaps especially, on their interaction. Human biology and culture are the product of adaptation to environmental constraints; traits that enhance an individual's ability to survive and reproduce should become common in human societies. In this view, the health and illness of a population can be conceived as measures of biocultural adaptation to a particular ecological setting. Changing patterns of morbidity and mortality, such as the epidemiological transition from infectious to chronic diseases, are the result of historical changes in lifestyle (*i.e.* culture) that affect health.

It is valuable to view obesity from this evolutionary perspective because of its great historical scope. The first appearance of the genus *Homo* occurred over two million years ago, and the first anatomically modern humans (*Homo sapiens sapiens*) became predominant about 40 000 years ago.[1] From either prehistoric point of departure, during most of human history, the exclusive cultural pattern was one of hunting and gathering. This original human lifestyle is rare, but a few such groups have been the subject of detailed anthropological study.[2]

Culture, in an anthropological sense, entails learned patterns of behavior and belief characteristic of a particular society. This second dimension of the anthropological perspective includes variables demonstrably related to the prevalence of obesity in a particular group—material aspects of lifestyle, like diet and productive economy—as well as more idealistic variables, the relationship of which to obesity is more speculative—such as aesthetic standards of ideal body type or the symbolic meaning of fatness.

Cross-cultural comparison thus serves two purposes, one relating to each of the two dimensions. First, technologically simple or primitive societies provide ethnographic analogies to amplify our understanding of prehistoric periods, or to test hypotheses about biocultural evolution. Such societies provide useful analogies to prehistoric societies, particularly in terms of economic production and diet. Second, cross-cultural comparison allows us to see our own society's health problems and cultural beliefs about health in a new way. In a heterogeneous society like the United States, where particular social groups have markedly high prevalences of obesity, attention to cultural variation in beliefs and behaviors has

practical value for medicine. Going beyond the U.S. to the numerous cultural varieties in the anthropological record gives us a fascinating range of further variation for systematic analysis. Such analysis is likely to reveal relationships that may not appear in other approaches, and attention to this wider range of cultures becomes even more relevant as obesity becomes a factor in international health.

In this paper we argue that throughout most of human history, obesity was never a common health problem, nor was it a realistic possibility for most people. This was because, despite the qualitative adequacy of their diet, most primitive societies have been regularly subjected to food shortages. Scarcity has been a powerful agent of natural selection in human biocultural evolution. Both genes and cultural traits that may have been adaptive in the context of past food scarcities today play a role in the etiology of maladaptive adult obesity in affluent societies. Following this evolutionary argument about the origins of obesity, we turn our attention to the cross-cultural range of beliefs about ideal body characteristics and the social meanings of obesity. A prerequisite for both discussions is a review of some basic facts concerning the social epidemiology of obesity.

HUMAN OBESITY: THREE SOCIAL EPIDEMIOLOGICAL FACTS

Humans are among the fattest of all mammals;[3] the proportion of fat to total body mass ranges from approximately 10 percent in the very lean to over 35 percent in the obese.[4] In other mammals, the primary function of fat deposits is insulation from cold, but in humans, it is now widely accepted that much (but not all) fat serves as an energy reserve. The social distribution of adiposity within and between human populations is not random, and that distribution provides a key to understanding obesity. Three widely recognized social epidemiological facts about obesity are particularly salient for this discussion: (1) higher levels of fatness and risk of obesity in females represents a fundamental aspect of sexual dimorphism in *Homo sapiens*; (2) obesity is rare in unacculturated primitive populations, but the prevalence often increases rapidly during modernization; and (3) the prevalence of obesity is related to social class, usually positively; but among females in affluent societies, that relationship is inverted.

Obesity and Gender

Differences in fat deposition are an important aspect of sexual dimorphism in *Homo sapiens*.[5] Sexual dimorphism is found in many primate species, and it is more pronounced in terrestrial, polygynous species. Humans are only mildly dimorphic in morphological variables like stature; a survey of human populations around the world reveals a range of dimorphism in stature from 4.7 to 9.0 percent.[6] The most significant aspects of sexual dimorphism reside predominantly in soft tissue. On average for young adults in an affluent society, adipose tissue constitutes approximately 15 percent of body weight in males and about 27 percent in females.[4]

Fatness, particularly peripheral or limb body fat, is the most dimorphic of the morphological variables, as shown in FIGURE 1. Adult men are larger than women

in stature (+8%) and total body mass (+20%), whereas women have more subcutaneous fat as measured in skinfold thicknesses. Bailey's analysis of sex differences in body composition using data from white Americans in Tecumseh, Michigan show greater female skinfolds in 16 of 17 measurement sites (the exception is the suprailiac). In general, adult limb fatness was much more dimorphic than trunk fatness: trunk: −7.5% (mean of 5 measures); arms: −35.4% (mean of 4 measures); and legs/thighs: −46.7% (mean of 5 measures).[4]

It is noteworthy that peripheral body fat does not have the same close association with chronic diseases (*i.e.* Type II diabetes mellitus or hypertension) as centripetal or trunk fatness. Thus the sexual dimorphism in fat deposition may be

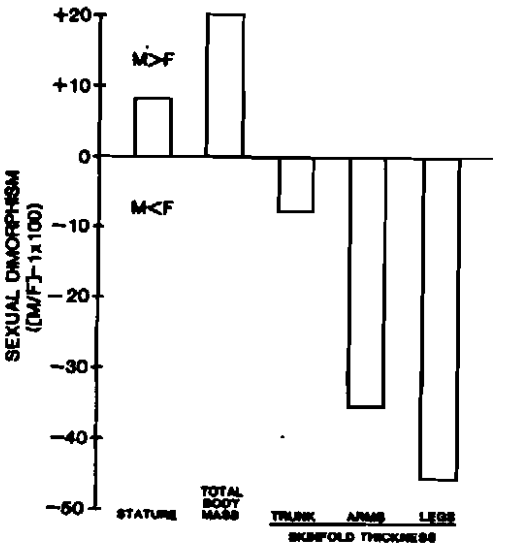

FIGURE 1. Sexual dimorphism in stature, body mass, and fat measures among white Americans aged 20 to 70 in Tecumseh, Michigan. Sexual dimorphism calculated by comparing male versus female means by ([M/F]-1×100); positive figures refer to greater male measures. Data are from Bailey.[4] Skinfold thicknesses are means of 4 sites (trunk) or 5 sites (arms and legs/thighs); the mean sexual dimorphism in all 17 fat measures is −19%.

unrelated to the dimension of obesity that most affects health. The developmental course of this dimorphism is also of interest. It is present in childhood, but increases markedly during adolescence, due to greatly increased divergence in the rate of fat gain.[7] Thus this divergence occurs at the time of reproductive maturation.

Although there is some population-specific variation in fat distribution, human sexual dimorphism in overall fat and peripheral fat appears to be universal. Although very small in stature and extremely lean by worldwide standards, the !Kung San, a hunting and gathering society of the Kalahari desert, show a similar pattern of sexual dimorphism, with a pronounced difference in measures of subcu-

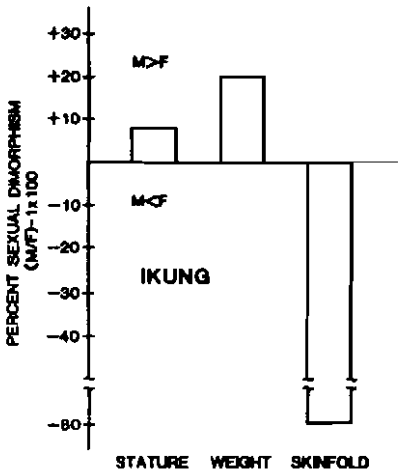

FIGURE 2. Sexual dimorphism in stature, weight, and mid-triceps skinfolds among !Kung San hunter-gatherers of Botswana. Sample includes 527 men and women, aged 10–80, all living in a traditional lifestyle. Sexual dimorphism calculated by comparing male versus female means by ([M/F]-1 × 100); positive figures refer to greater male measures. Note the larger male/female difference in fat than among white Americans shown in FIGURE 1.

taneous fat for women (see FIG. 2). The sexual dimorphism of the !Kung San is about +6.7% for stature, +20% in weight, and −80% in midtriceps skinfolds.[8]

Sex differences are also seen in the prevalence of obesity. Despite methodological differences in the operational definition of obesity and in sampling frameworks, data from the 14 populations shown in FIGURE 3 show that in all of the surveys, females have a higher prevalence of obesity than males. Variations in the male/female ratio of proportions of obesity seen in this figure reveal a new regularity that remains to be explained—namely, that more affluent western populations have more equivalent male/female ratios of obesity prevalence than poor populations in the underdeveloped world.

Obesity and Modernization

The second social epidemiological fact regards culture change and the origins of obesity. It is significant that anthropometric studies of traditional hunting and gathering populations report no obesity. By contrast, numerous studies of traditional societies undergoing the process of modernization (or Westernization) report rapid increases in the prevalence of obesity.[9–12] A classic natural experiment study by Prior and colleagues compared the diet and health of Polynesian islanders at different stages of acculturation: the prevalence of obesity in the most traditional island (Pukapuka) was 15.4%; for a rapidly modernizing population (Rarotonga), it was 29.3%; and for urban Maoris it was 35.4 percent.[13] Trowell and Burkitt, whose recent volume contains 15 case studies of societies experiencing increased obesity and associated Western diseases during modernization, conclude that obesity is the first of these diseases of civilization to appear.[14]

Change in diet appears to be a primary cause for the link between modernization and obesity. More precisely, westernization of traditional diets involves decreased intake of fiber and increased intake of fats and sugar. The seeming inevitability of this change toward a less healthy diet is impressive but not well understood. We suspect that more is involved in this dietary change than the simple imitation of prestigous western foodways: the quick shift from primitive to high fat, high sugar diets with the advent of affluence may have evolutionary roots.

Obesity and Social Class

The third and possibly most important fact concerning the social epidemiology of obesity is its association with social class and ethnicity. Research primarily by Stunkard and colleagues have shown that social class and obesity are inversely related, at least in heterogenous and affluent societies like the United States.[15,16] The inverse correlation of social class and obesity is very strong, particularly for females. A few studies, however, have found a weak association of class and

FIGURE 3. Gender differences in prevalence of obesity in 14 populations by general economic development. Only complete society prevalences were used, and underdeveloped populations were limited to groups with a significant degree of obesity. Operational definitions of obesity differ between studies. Populations include: Pukapuka, Rarotonga and New Zealand urban Maori,[13] Capetown Bantu, Guyana, Lagos (Nigeria), Puerto Rico, Germany, London,[12] U.S. Blacks, and U.S. Whites.[16] The unbroken line demarcates equal male/female obesity rates. The broken line indicates an apparent division between the proportion of gender difference in obesity between developed and underdeveloped countries.

obesity for groups including men, children, and certain ethnic groups.[17] But there is no doubt that social factors play a role in the epidemiology of obesity, and that the high prevalence of obesity for lower class women reflects that, "obesity may always be unhealthy, but it is not always abnormal."[15]

The association between socioeconomic class and obesity among adult women, therefore, merits special attention. This association is not constant through the life cycle. Garn and Clark describe a pattern of growth called "the socioeconomic reversal of fatness in females": in childhood, middle and upper class girls (and boys) are consistently fatter than poorer girls; at around the time of puberty, the relative level of fatness in the two groups switches; and in adulthood, lower class women are consistently fatter than middle and upper class women.[18]

In the traditional societies typically studied by anthropologists, the social epidemiology of adult obesity is not well documented. The data indirectly suggest, however, that the relationship of obesity and social class is often a positive one. Surveys from developing countries show a positive association between social class and obesity prevalence and, as expected, an inverse correlation between class and protein-calorie malnutrition.[19]

EVOLUTION AND OBESITY: DIET, FOOD SCARCITIES, AND ADAPTATION

Both genes and lifestyle are involved in the etiology of obesity, although the relative importance of either factor, and the ways in which they interact, are not thoroughly understood.[20] We suggest that both genetic and cultural predispositions to obesity may be products of the same evolutionary pressures, involving two related processes: first, traits that cause fatness were selected because they improved chances of survival in the face of food scarcities, particularly for pregnant and nursing women; second, fatness may have been directly selected because it is a cultural symbol of social prestige and an index of general health.

Cultural Evolution from Food Foraging to Food Production

For 95 to 99 percent of our history, humans lived exclusively as hunters and gatherers. Studies of contemporary food foragers reveal some cultural and biological commonalities despite variation in their ecological context. Food foragers live in small, socially flexible, seminomadic bands; experience slow population growth due to prolonged nursing and high childhood mortality; enjoy high quality diets and spend proportionately little time directly involved in food collection; and are generally healthier and better nourished than many contemporary third world populations relying on agriculture.

The reality of food foraging life is to be found somewhere between the Hobbesian "nasty, brutish, and short" and the "original affluent society," a phrase popularized by some anthropologists during the 1960s.[21] It is important to dispel romantic notions of food foragers, like the !Kung San of Botswana, as innocents leading a carefree existence; they suffer from a 50 percent child mortality rate, a low life expectancy at birth, and even a homicide rate that rivals that of many metropolitan areas. Yet, given the length of time that it has survived, food-foraging must be considered a successful strategy of adaptation.

Approximately 12 000 years ago, some human groups shifted from a food foraging economy to one of food production. This shift required the domestication

of plants and animals, an evolutionary process in which humans acted as agents of selection for domestic phenotypes. This economic transformation, known as the neolithic revolution, may be considered the most important event in human history because it allowed population growth and the evolution of complex societies and civilization. The current consensus among archeologists is that the new economy based on agriculture was something that people were effectively forced to adopt because of ecological pressures from population growth and food scarcities.[22] Nearly everywhere it has been studied, the switch from food foraging to agriculture is associated with osteological evidence of nutritional stress, poor health, and diminished stature.[23]

It is important to note that the beginning of agriculture is linked to the emergence of social stratification. Civilization was made possible by the political, economic, and military power of urban elites over agricultural surpluses collected in the form of tribute. For members of the ruling class, social stratification has numerous advantages, the most important of which is guaranteed access to food during periods of relative food scarcity. In state level societies, nutritional stress is never evenly distributed across the social spectrum. Functionally, the poor insulate the rich from the threat of starvation.

Obesity is thus not simply a disease of civilization. It is common only in certain kinds of civilized societies—ones with an absolute level of affluence so that even the poor have access to enough food to become obese. Trowell has suggested that obesity became common in Europe, first in elites and then the rest of society, only about 200 years ago.[24]

The Adequacy of Preindustrial Diets

The adequacy of the diet of food foragers, and by close analogy that of our prehistoric ancestors, has been the subject of considerable interest. New analytical techniques now being applied to skeletal populations by archeologists are expanding our knowledge of prehistoric diet.[25] A recent analysis of the nutritional components of the Paleolithic diet,[26] shown in TABLE 1, suggests that the diet of prehistoric food foragers was high in protein, fiber, and vegetable carbohydrates and low in sugar and saturated fats. There are striking similarities of this reconstructed stone age diet and the daily nutritional requirements recommended by

TABLE 1. Late Paleolithic, Contemporary American, and Currently Recommended Dietary Composition[26]

	Late Paleolithic Diet	Contemporary American Diet	Current Recommendations
Total dietary energy (percent)			
Protein	34	12	12
Carbohydrate	45	46	58
Fat	21	42	30
P : S ratio[a]	1.41	0.44	1.00
Cholesterol (mg)	591	600	300
Fiber (gm)	45.7	19.7	30–60
Sodium (mg)	690	2300–6900	1100–3300
Calcium (mg)	1580	740	800–1200
Ascorbic Acid (mg)	392.3	87.7	45

[a] Polyunsaturated: saturated fat ratio.

the U.S. Senate Select Committee, in all areas except cholesterol intake. With this exception, the Paleolithic diet could be considered a model preventive diet, more stringent and thus probably more healthy even than the currently recommended one. But this fact reflects limitations in the availability and choice of foods rather than some primitive wisdom about a nutritionally optimal diet. Studies of culture change have repeatedly shown that when traditional populations with healthy diets have the opportunity, they readily switch to the less healthy (except in terms of abundance) Western diets.

Another method of estimation of the adequacy of the preindustrial diet is through cross-cultural comparison. Marjorie Whiting used ethnographic data from the Human Relations Area Files (HRAF) and nutritional studies to survey some major components of diet in a representative sample of 118 nonindustrial societies with economies based on food-foraging, pastoralism, simple horticulture, and agriculture.[27] (The HRAF is a compilation of ethnographic information on over 300 of the most thoroughly studied societies in the anthropological and historical record, cross-indexed for hundreds of variables. Subsamples of societies are chosen for representativeness of world areas and economic types.) In general, the quality of nonindustrial diets is high, the mean percent of calories derived from fat and carbohydrates falling within the recommended U.S. standards, and the percentage of protein nearly twice the recommended amount.[26] For the 84% of societies where food supply is adequate or plentiful, therefore, the diet seems superior to that of the United States. The major inadequacy of preindustrial diets and productive economies, however, is their susceptibility to food shortages.

The Ubiquity of Food Shortages

Food shortages have been so common in human prehistory and history that they could be considered a virtually inevitable fact of life in the past. Whiting's cross-cultural survey found some form of food shortages for all of the societies in the sample. FIGURE 4 illustrates the distribution of the frequency of shortages. In 28.7 percent of the societies, food shortages are rare, occurring every 10 to 15 years, whereas in 24.3 percent they happen every 2 to 3 years. Shortages occur annually or even more frequently in 47 percent of the societies. Half of these are annual shortfalls, which Whiting described as happening "a few weeks preceding harvest, anticipated and expected, recognized as temporary," and in the other 23.5 percent of the societies, shortages are more frequent than once a year. This distribution has great evolutionary significance.

The relative severity of these shortages is shown in FIGURE 5. For the 113 societies with adequate data, 29.3 percent had severe shortages that were characterized by the exhaustion of emergency foods, many people desperate for food, and starvation deaths—in short, a famine. Moderate shortages, in which food stores were used up, where emergency foods were used, and where people lost considerable weight, were found in 34.4 percent of the societies. Finally, 36.3 percent had mild food shortages, with fewer meals than usual, some weight loss, but no great hardships.[27] Two examples, one archeological and one ethnographic, will serve to illustrate these patterns and their relationship to the relative reliance on food foraging or food production.

The southwestern United States, where we today find Native American groups like the Pima, with endemic obesity and a high prevalence of type II

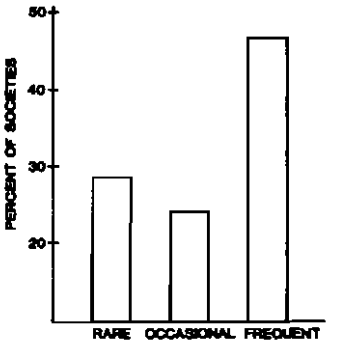

FIGURE 4. Frequency of food shortages in a sample of 115 preindustrial societies. Rare shortages occur every 5–10 years; occasional shortages occur every 2–3 years; and frequent shortages happen one or more times a year.[27]

diabetes,[28] was in the prehistoric past the frequent site of food shortages. Tree-ring analysis has been used to calculate the frequency of ecological stresses and resulting food shortages affecting these people, the builders of the impressive kivas and cliff dwellings. The data from southern New Mexico suggest that, between 600 and 1249 A.D., every other year had inadequate rainfall for dry farming, and that there was severe stress (more than two successive years of total crop failures) at least once every 25 years.[29] The complex agricultural societies of the prehistoric southwest expanded quickly during a period of uncharacteristically good weather. Despite a variety of social adaptations to food shortages, when lower rainfall pattern resumed, the complex chiefdomships could not be maintained: the population declined, and the culture devolved back to food foraging.

Medical studies of the !Kung San hunger-gatherers have found that adults were in generally good health, but exhibited periodic mild caloric undernutrition.[30] Seasonal variation in the availability of food resulted in an annual cycle of weight loss and weight gain in both food-foraging and food-producing societies. Agriculturalists, however, experience greater seasonal swings of weight loss and

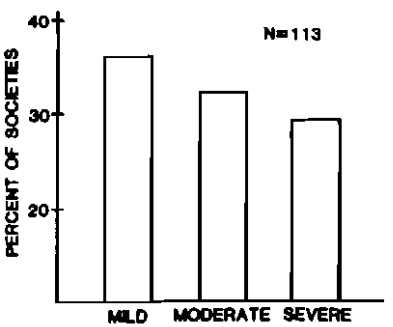

FIGURE 5. Severity of food shortages in a sample of 113 preindustrial societies.

gain. Seasonal weight loss among the !Kung, although it varied by ecological region and year, averaged between 1 and 2 percent of adult body weight.[8,31] Seasonal weight losses among African agriculturalists are more severe, averaging 4 to 6.5 percent of total body weight in typical years.[32]

Biological and Cultural Adaptations to Scarcity

Food shortages suggest a hypothesis of the evolution of obesity. Because shortages were ubiquitous for humans under natural conditions, selection favored individuals who could effectively store calories in times of surplus. For three-fourths of the societies, such stores would be depleted, or at least called on, every two to three years, and sometimes more frequently.

Medical data on famine victims show that, in addition to outright starvation, malnutrition from food shortages has a synergistic effect on infectious disease mortality, as well as decreasing birth weights and rates of child growth.[33] Females with greater energy reserves in fat have a selective advantage over their lean counterparts in withstanding the stress of food shortage, not only for themselves, but for their fetuses or nursing children. Humans have evolved to "save up" food energy for the inevitability of food shortages through the synthesis and storage of fat. Moreover, females, whose reproductive fitness depends upon their ability to withstand the nutritional demands of pregnancy and lactation, appear to have been selected for more slow-releasing peripheral body fat than males.

In this evolutionary context the usual range of human metabolic variation must have produced many individuals with a predisposition to become obese; yet they would, in all likelihood, never have the opportunity to do so. Furthermore, in this context there could be little or no natural selection against such a tendency. Selection could not provide for the eventuality of continuous surplus because it had simply never existed.

There is little evidence that obesity, at least moderate obesity, reduces Darwinian reproductive fitness. A follow-up study of participants to the Third Harvard Growth Study found a positive correlation between fatness and fertility when holding both social class and ethnicity constant.[34] The influence of social class is important and complex: in developed countries, fatness, lower social class, and fertility are all positively associated, whereas in underdeveloped countries, fatness and fertility are associated only in upper socioeconomic classes.[35] A minimal level of female fatness may increase lifetime reproductive success because of its association with regular cycling as well as earlier menarche. In preindustrial societies, social status is related, both symbolically and statistically, to fertility and fatness.

It is likely that under some conditions fatness is an adaptation to successful completion of pregnancy. Recommended weight gain during pregnancy is between 20 and 30 pounds, and failure to gain weight (which may be caused by inadequate caloric intake) is considered a clinically ominous sign.[36,37] Especially for women with lower gains and lower pregravid weight, weight gain is positively correlated with birth weight and negatively correlated with perinatal mortality. The energy cost of pregnancy is estimated to be 80 000 kcal (300 kcal/d), assuming no change in energy output[38]—a reasonable assumption for nonindustrial societies. Intrauterine growth retardation associated with working during pregnancy is greatest against the background of low pregravid weight and low pregnancy weight gain.[39] Failure to supplement usual intake adequately will result in a depletion of pregravid tissue reserves.

The ongoing energy cost of lactation, if milk is the sole primary infant food, is higher than that of pregnancy, and lactation in traditional societies may last up to four years and be superimposed on early pregnancy. Estimated needed supplements, converted to energy in milk with high efficiency (around 90%), range from 500 kcal/d in the early postpartum period to 1000 kcal/d by the end of the first year.[36,40] Well-fed women with high pregnancy weight gains can supplement less and safely attain a deliberately negative energy balance during lactation by drawing on prepartum fatty tissue reserves.[41] At the other extreme, experimental interventions in Gambia[42] and Guatemala[43] provided caloric supplementation to pregnant and lactating women. In the Gambian case, women readily took supplements larger than the above-mentioned estimates, and supplemented women who completed pregnancy in the lean season experienced a six-fold reduction of the proportion of low-birth-weight infants, ending up with an incidence typical of developed countries (4.7%). In both populations, supplements during lactation also increased the duration of postpartum infertility.

Using the figure 80 000 kcal for pregnancy, and a conversion rate of 9.1 kcal/g, pregnancy with no supplementation could be maintained by pregravid tissue reserves amounting to 8.8 kg of fat. Viewed from the perspective of the costs of shortage rather than the costs of pregnancy *per se*, an annual or less frequent shortage of the length and type experienced by the Gambian women, whether occurring during pregnancy or lactation, would be cushioned against by excess fat amounting to 15 to 20% of body weight. In as much as women in traditional societies spend the great majority of their reproductive lives either pregnant or nursing, an ideal of plumpness would be adaptive throughout that period. A custom such as the fattening hut for brides-to-be (see below) might provide a critical head-start on this lifelong reproductive energy drain.

Humans have also evolved other cultural mechanisms to minimize the effects of food shortages, including economic diversification, storage of foods, knowledge of possible famine foods, conversion of surplus food into durable valuables to be exchanged for food in emergencies, and cultivation of strong social relations with individuals in other regions.[44] These mechanisms act as buffers between environmental fluctuation and biological adaptation.

THE SOCIAL MEANING OF OBESITY: CROSS-CULTURAL COMPARISONS

Fatness is symbolically linked to psychological dimensions such as self-worth and sexuality in many societies of the world, including our own, but the nature of that symbolic association is not constant. In mainstream U.S. culture, obesity is socially stigmatized[45] even to the point of abhorrence. Weight loss is a major industry in the U.S., with annual expenditures of over five billion dollars. Most cultures of the world, by contrast, view fatness as a welcome sign of health and prosperity.

In an obesity-prevention campaign in a Zulu community outside of Durban,[46] one of the health education posters depicted an obese woman and an overloaded truck with a flat tire, with a caption "Both carry too much weight." Another poster showed a slender woman easily sweeping under a table next to an obese woman who is using the table for support; it has the caption "Who do you prefer to look like?" The intended message of these posters was misinterpreted by the community because of a cultural connection between obesity and social status. The woman in the first poster was perceived to be rich and happy, since she was

not only fat, but had a truck overflowing with her possessions. The second poster was perceived as a scene of an affluent mistress directing her underfed servant.

Given the rarity of obesity in unacculturated preindustrial societies, it is not surprising that many groups have no ethnomedical definition of or concern with obesity. Given the frequency of food shortages, it is equally predictable that thinness, rather than fatness, will be deemed a serious medical symptom. The Tupinamba of Brazil have no descriptive term for fat people, but are reported to fear the symptom of thinness (*angaiuare*).[47] In the preindustrial context, thin people are to be pitied; this is the case for food foragers like the !Kung San, where culturally defined thinness (*zham*) is viewed as a symptom of starvation.

It may be large body size rather than obesity *per se* that in agricultural societies becomes an admired symbol of health, prestige, prosperity, or maternity. The agricultural Tiv of Nigeria, for example, distinguish between a very positive category, too big (*kehe*), and an unpleasant condition, to grow fat (*ahon*).[48] The first is a compliment—sign of prosperity that also refers to the seasonal weight gain of the early dry season when food is plentiful. The second term refers to a rare and undesirable condition.

Even in the industrialized U.S., there is ethnic variation in definitions of obesity. Some Mexican-Americans have coined a new term, *gordura mala* (bad fatness) because the original term *gordura* continues to have positive cultural connotations.[49] There has also been historical variation in clinical standardized definitions of obesity in American medicine. Between 1943 and 1980, definitions of ideal weights declined for women but not for men; more recently, upward revision of those standards has been proposed, due to an apparent disjunction in some data sets between cosmetically ideal weights and the weights at which mortality is minimized. This, however, remains controversial.[50,51] In any case, the definition of obesity is ultimately linked to cultural conceptions of normality, beauty, and health.

Cross-Cultural Variation in Ideal Body Type

In addition to the basic association between plumpness and health, culturally defined standards of beauty may have been a factor in the sexual selection for phenotypes predisposed to obesity. In a classic example, Malcom described the custom of fattening huts for the seclusion of elite Efik pubescent girls in traditional Nigeria.[52] A girl spent up to two years in seclusion before marriage, and at the end of this rite of passage she possessed symbols of womanhood and marriageability: a three-tiered hairstyle, clitoridectomy, and fatness. This fatness was a primary criterion of beauty as it was defined by the elites, who had the economic resources to participate in this custom. Similar fattening huts were found in other parts of West Africa.

Among the Havasupai of the American Southwest, if a girl at puberty is thin, a fat woman stands (places her foot) on the girl's back so that she will become attractively plump. In this society, fat legs, and to a lesser extent arms, are considered essential to beauty.[53] The Tarahumara of Northern Mexico, whose men are famous as long-distance runners, reportedly consider large, fat thighs as the first requisite of beauty; a good-looking woman is called a "beautiful thigh."[54] Among the Amhara of the Horn of Africa, thin hips are called "dog hips" in a typical insult.[55] A South African Bemba courting song has the following verse: "Hullo Mama, the beautiful one, let us go to town/You will be very fat, you girl, if you stay with me."[56]

But how common is such a cultural connection between beauty and fat? There has been no systematic cross-cultural survey of definitions of feminine beauty or ideal body type among the societies of the world. The lack of a survey reflects, in part, the failure of ethnographers and historians to report adequately on this cultural element. Of the 325 cultures coded by the Human Relation Area Files, only 58 have adequate data to estimate some characteristic of ideal female body type.

The data summarized in TABLE 2 must be considered cautiously for a number of reasons: Because of the paucity of ethnographic data, a representative sample is impossible. Although limited to sources rated good or better, there is potential ethnographer bias toward the exotic. Observations cover a wide historical time span, often characterized by substantial cultural changes. There is the problem of relative standards; given the endemic obesity in modern society, what we consider normal may be fat to members of a society where obesity is uncommon. There is no consideration of intracultural diversity. Because the unit of analysis is a culture, the HRAF data base is skewed toward demographically small and

TABLE 2. Cross-Cultural Standards of Female Beauty

	Number of Societies	Percent of Category
Overall Body		
Extreme Obesity	0	0
Plumpness/moderate fat	31	81
thin/abhorence of fat	7	19
Breasts		
Large or long	9	50
small/abhorence of large	9	50
Hips and Legs		
Large or Fat	9	90
Slender	1	10
Stature		
Tall	3	30
Moderate	6	60
Small	1	10

technologically simple societies; the HRAF data base does not include the U.S. or modern European societies.

Granting the weaknesses of the data base, some guarded generalizations still seem possible. Cultural standards of beauty seem to be based on the normal characteristics of the dominant group of a society; they do not refer to physical extremes. No society on record has an ideal of extreme obesity. On the other hand, the desirability of plumpness or being filled out is found in 81 percent of societies for which there is data. This standard, which probably includes the clinical categories of overweight and mild obesity, apparently refers to the desirability of subcutaneous fat deposits. For societies where data on ideal standards on hips and legs is available, it appears that plumpness in peripheral body fat is commonly preferred. Societies that favor plumpness as a standard of beauty are found in all of the major world culture areas, with the exception of Asia. There appears to be no trend in preference for breast-size or stature. Ethnographic discussion of beauty in other societies often emphasizes cultural enhancements to the body, such as scarification, clothes, body paint, jewelry, and other adorn-

ments, rather than attributes of the body itself.[57] Standards of sexual beauty are based upon images of nubile, postpubertal, young-adult years in virtually all societies.

Fatness may also be a symbol of maternity and nurturance. In traditional societies where a woman attains her proper status only through motherhood, this symbolic association increases the cultural acceptability of obesity. A fat woman, symbolically, is well taken care of, and she in turn takes good care of her children. Fellahin Arabs in Egypt describe the proper woman as an "envelope for conception," and therefore a fat woman is a desirable ideal because she has more room to bear the child, lactate abundantly, and give warmth to her children.[58]

Although there is cross-cultural variation in standards of beauty, this variation falls within a certain range. American ideals of thinness occur in a setting where it is easy to become fat, and preference for plumpness occurs in settings where it is easy to remain lean. In context, both standards require the investment of individual effort and economic resources; furthermore, each in its context involves a display of wealth. In poor societies the rich impress the poor by becoming fat, which the poor cannot do. In rich societies even the poor can become fat, and avidly do; therefore, the rich must impress by staying thin, as if to say, "We have so little doubt about where out next meal is coming from, that we don't need a single gram of fat store." Cultural relativism in feminine beauty standards, therefore, may be limited by evolutionarily determined human universals on the one hand and by lawful cross-cultural variation on the other.

The ethnographic record concerning body preferences in males is very weak. The HRAF data base includes only 12 societies with adequate information to gauge ideal male body type. In all of these societies, the expressed preference was for a muscular physique and for tall or moderately tall stature. Other characteristics mentioned include broad shoulders and being well filled out. One extreme in this admiration of large body size would be Japanese Sumo wrestlers whose program to build large bodies is really purposeful obesity; similar patterns of fattening young male wrestlers is found in Polynesia.[59] With few exceptions (*e.g.* the !Kung San)[8] human societies admire large body size, but not necessarily fatness, as an attribute of attractiveness in men. All of these physical characteristics can be considered as indicators of general health and nutritional status. Large body size and even obesity, however, are desirable because they symbolize economic success, political power, and social status in some societies.

Big Men, political leaders in tribal New Guinea, are described by their constituents in terms of their size and physical well-being (as well as other attributes). A Big Man may be described as a tall forest beech tree or as a man "whose skin swells with 'grease' [or fat] underneath".[60] Large body size may, in fact, be an index of differential access to food resources. This is seen in chiefdomships, as in ancient Polynesia, where hereditary political leaders sit at the hub of a redistribution system in which chiefly families are assured a portion of each family's harvest. The spiritual power (*mana*) and noble breeding of a Polynesian chief is expected to be seen in his physical appearance. One ethnographer in Polynesia was asked, "Can't you see he is a chief? See how big he is?"[61] The Bemba of South Africa believe that fatness in a man demonstrates not only his economic success but also his spiritual power in fending off the sorcery attacks.[62] A similar symbolic association can be assigned to deities. The corpulence of the seated Buddha, for example, symbolizes his divinity and otherworldliness.

Cultural variation in the meaning of fatness is also found among ethnic groups in the United States. Massara's ethnographic study of the cultural meanings of weight in a Puerto Rican community in Philadelphia[63] documents the positive

associations and lack of social stigma of obesity. In addition, quantitative evidence[64] suggests that there are significant differences in ideal body preferences between this ethnic community and mainstream American culture. Positive evaluations of fatness may also occur in lower class Black Americans[65] and Mexican Americans.[17] There is also heterogeneity within these ethnic groups; upwardly mobile ethnics more closely resemble mainstream American culture in attitudes about obesity and ideal body shape.

In contrast to these ethnic minorities, and most of the cultures of the world, the ideal of female body shape in dominant middle/upper class America is thin. Studies suggest that females hold this cultural value more strongly than males,[66] who tend to be more satisfied with their own current body shape. Over the past three decades cosmetic ideals of female body shape have gotten thinner,[67] even thinner than medical ideals. Cultural beliefs about attractive body shape, therefore, place pressure on females to lose weight, and appear to be involved in the etiology of anorexia and bulimia. Neither the socioeconomic reversal of fatness in females nor the social history of symbolism of thinness has been adequately examined. Thinness, like tanning, is a contemporary symbol of economic status and leisure time for women. Both may be unhealthy, and both represent reversals of previous ideals.

Finally, although we have focused on the role of food shortages in human history, they are unfortunately not limited to the past. The drought and famine in the Horn of Africa and the Sahel have justifiably received world attention. Even in the United States, arguably the richest nation in human history, an estimated 20 million people are hungry.[68] This continuing worldwide epidemic of hunger presents a powerful and tragic counterbalance to our contemplation of the new epidemic of obesity and a reminder of the sometimes harsh realities of our history.

SUMMARY

An anthropological perspective on obesity considers both its evolutionary background and cross-cultural variation. It must explain three basic facts about obesity: gender dimorphism (women > men), an increase with modernization, and a positive association with socioeconomic status. Preindustrial diets varied in quality but shared a tendency to periodic shortages. Such shortages, particularly disadvantageous to women in their reproductive years, favored individuals who, for biological and cultural reasons, stored fat. Not surprisingly, the majority of the world's cultures had or have ideals of feminine beauty that include plumpness. This is consistent with the hypothesis that fat stores functioned as a cushion against food shortages during pregnancy and lactation. As obesity has increased, the traditional gap between males and females in its prevalence has narrowed. Under Western conditions of abundance, our biological tendency to regulate body weight at levels above our ideal cannot be easily controlled even with a complete reversal of the widespread cultural ideal of plumpness.

REFERENCES

1. PILBEAM, D. 1984. The descent of hominoids and hominids. Sci. Am. **250:** 84–96.
2. LEE, R. B. & I. DEVORE, Eds. 1968. Man the Hunter. Aldine. Chicago, IL.
3. PITTS, G. C. & T. R. BULLARD. 1968. Some interspecific aspects of body composition in mammals. *In* Body Composition in Animals and Man. National Academy of Science, Washington D.C. Pub. No. 1598:45–70.

4. BAILEY, S. M. 1982. Absolute and relative sex differences in body composition. *In* Sexual dimorphism in *Homo sapiens*. R. L. Hall, Ed. Praeger Scientific. New York.
5. POND, C. M. 1978. Morphological aspects and the ecological and mechanical consequences of fat deposition in wild vertebrates. Ann. Rev. Ecol. Syste. **9:** 519–570.
6. STINI, W. A. 1978. Malnutrition, body size and proportion. Ecol. Food Nutr. **1:** 125–132.
7. TANNER, J. M. 1962. Growth at Adolescence. Blackwell Scientific. Oxford.
8. LEE, R. B. 1979. The !Kung San: Men, Women, and Work in a Foraging Society. Harvard University Press. Cambridge, MA.
9. PAGE, L. B., A. DAMON & R. C. MOELLERING. 1974. Antecedents of cardiovascular disease in six Solomon Islands societies. Circulation **49:** 1132–1146.
10. ZIMMET, P. 1979. Epidemiology of diabetes and its macrovascular manifestations in Pacific populations: the medical effects of social progress. Diabetes Care **2:** 144–153.
11. WEST, K. 1978. Diabetes in American Indians. *In* Advances in metabolic disorders. Academic Press. New York.
12. CHRISTAKIS, G. 1973. The prevalence of adult obesity. *In* Obesity in Perspective. G. Bray, Ed. **2:** 209–213. Fogarty International Center Series on Preventive Medicine.
13. PRIOR, I. A. 1971. The price of civilization. Nutr. Today **6**(4): 2–11.
14. TROWELL, H. C. & D. P. BURKITT. 1981. Western Diseases: Their Emergence and Prevention. Harvard University Press. Cambridge, MA.
15. GOLDBLATT, P. B., M. E. MOORE & A. J. STUNKARD. 1965. Social factors in obesity. J. Am. Med. Assoc. **192:** 1039–1044.
16. BURNIGHT, R. G. & P. G. MARDEN. 1967. Social correlates of weight in an aging population. Milbank Mem. Fund Q. **45:** 75–92.
17. ROSS, C. E. & J. MIROWSKY. 1983. Social epidemiology of overweight: a substantive and methodological investigation. J. Health Soc. Behav. **24:** 288–298.
18. GARN, S. M. & D. C. CLARK. 1976. Trends in fatness and the origins of obesity. Pediatrics **57:** 443–456.
19. ARTEAGA, P., J. E. DOS SANTOS & J. E. DUTRA DE OLIVEIRA. 1982. Obesity among school-children of different socioeconomic levels in a developing country. Int. J. Obesity **6:** 291–297.
20. STUNKARD, A. J., T. I. A. SORENSON, C. HANIS, T. W. TEASDALE, R. CHAKABORTY, W. J. SCHULL & F. SCHULSINGER. 1986. An adoption study of obesity. N. Engl. J. Med. **314:** 193–198.
21. SAHLINS, M. 1972. Stone Age Economics. Aldine. Chicago, IL.
22. WENKE, R. J. 1980. Patterns in Prehistory. Oxford. New York.
23. COHEN, M. N. & G. J. ARMELAGOS, Eds. 1984. Paleopathology at the Origins of Agriculture. Academic Press. New York.
24. TROWELL, H. 1975. Obesity in the western world. Plant Foods for Man **1:** 157–165.
25. GILBERT, R. I. & J. H. MIELKE, Eds. 1985. The Analysis of Prehistoric Diets. Academic Press. New York.
26. EATON, S. B. & M. KONNER. 1985. Paleolithic nutrition: a consideration of its nature and current implications. N. Eng. J. Med. **312:** 283–289.
27. WHITING, M. G. 1958. A cross-cultural nutrition survey. Doctoral Thesis. Harvard School of Public Health. Cambridge, MA.
28. KNOWLER, W. C., D. J. PETTITT, P. J. SAVAGE & P. H. BENNETT. 1981. Diabetes incidence in Pima Indians: contribution of obesity and parental diabetes. Am. J. Epidemiol. **113:** 144–156.
29. MINNIS, P. E. 1985. Social Adaptation to Food Stress: A Prehistoric Southwestern Example. University of Chicago Press. Chicago, IL.
30. TRUSWELL, A. S. & J. D. L. HANSEN. 1977. Diet and nutrition of hunter-gatherers. *In* Health and Disease in Tribal Societies. Ciba Foundation, Eds. 213–226. Elsevier. Amsterdam.
31. WILMSEN, E. 1978. Seasonal effects of dietary intake in the Kalahari San. Fed. Proc. Fed. Am. Soc. Exp. Bio. **37:** 65–71.
32. HUNTER, J. M. 1967. Seasonal hunger in a part of the west African savanna: a survey of body weights in Nangodi, north-east Ghana. Trans. Inst. Br. Geog. **41:** 167–85.

33. STEIN, Z. & M. SUSSER. 1975. The Dutch famine, 1944–1945, and the reproductive process. Pediatr. Res. **9:** 70–76.
34. SCOTT, E. C. & C. J. BAJEMA. 1982. Height, weight and fertility among participants of the third Harvard growth study. Hum. Biol. **54:** 501–516.
35. GARN, S. M., S. M. BAILEY & I. T. T. HIGGENS. 1980. Effects of socioeconomic status, family life, and living together on fatness and obesity. *In* Childhood Prevention of Atherosclerosis and Hypertension. R. Lauer & R. Skekelle, Eds. Raven Press. New York.
36. EASTMAN, N. J. & E. JACKSON. 1968. Weight relationships in pregnancy. Obstet. Gynecol. Surv. **23:** 1003–1025.
37. NAEYE, R. L. 1979. Weight gain and outcome of pregnancy. Am. J. Obstet. Gynecol. **135:** 3–9.
38. BLACKBURN, M. W. & D. H. CALLOWAY. 1976. Energy expenditure and consumption of mature, pregnant and lactating women. J. Am. Diet. Assoc. **69:** 29–37.
39. NAEYE, R. L. & E. C. PETERS. 1982. Working during pregnancy: effects on the fetus. Pediatrics **69:** 725–727.
40. THOMSON, A. M., F. E. HYTTEN & W. Z. BILLEWICZ. 1970. The energy cost of human lactation. Br. J. Nutr. **24:** 565–572.
41. BUTTE, N. F., C. GARZA, J. E. STUFF, E. O. SMITH & B. L. NICHOLS. 1984. Effect of maternal diet and body composition on lactational performance. Am. J. Clin. Nutr. **39:** 296–306.
42. PRENTICE, A. M., R. G. WHITEHEAD, M. WATKINSON, W. H. LAMB & T. J. COLE. 1983. Prenatal dietary supplementation of African women and birth-weight. Lancet **1:** 489–492.
43. DELGADO, H., A. LECHUG, C. YARBROUGH, R. MARTORELL, R. E. KLEIN & M. IRWIN. 1977. Maternal nutrition—its effect on infant growth and development and birth spacing. *In* Nutritional Impacts on Women. K. S. Moghissi & T. N. Evans, Eds. Harper & Row. Hagerstown, MD.
44. COLSON, E. 1979. In good years and bad: food strategies of self-reliant societies. J. Anthropol. Res. **35:** 18–29.
45. CAHNMAN, W. J. 1968. The stigma of obesity. Sociol. Q. **9:** 294–297.
46. GAMPEL, B. 1962. The "Hilltops" community. *In* Practice of Social Medicine. S. L. Kark & G. E. Steuart, Eds. E. & S. Livingstone. London.
47. EVREUX, Y. 1864. Voyage dans le Nord du Bresil Fait durant les Annees 1613 et 1614. F. Denis, Ed. A. Franch. Paris and Leipzig.
48. BOHANNAN, P. & L. BOHANNAN. 1969. A source notebook on Tiv religion (5 vol.). Human Relations Area Files. New Haven, CT.
49. RITENBAUGH, C. 1982. Obesity as a culture-bound syndrome. Cult. Med. Psychiatry **6:** 347–361.
50. Metropolitan Life Foundation. 1983. Height and Weight Tables. Metropolitan Life Insurance Company.
51. BURTON, B. T., W. R. FOSTER, J. HIRSCH & T. B. VAN ITALLIE. 1985. Health implications of obesity: an NIH consensus development conference. Intl. J. Obesity **9:** 155–169.
52. MALCOM, L. W. G. 1925. Note on the seclusion of girls among the Efik at Old Calabar. Man **25:** 113–114.
53. SMITHSON, C. L. 1959. The Havasupai Woman. U. Utah Press. Salt Lake City, UT.
54. BENNETT, W. C. & R. M. ZINGG. 1935. The Tarahumara: an Indian Tribe of Northern Mexico. U. Chicago Press. Chicago, IL.
55. MESSING, S. D. 1957. The Highland Plateau Amhara of Ethiopia. Doctoral Dissertation (Anthropology). U. Pennsylvania. Philadelphia, PA.
56. POWDERMAKER, H. 1960. An anthropological approach to the problem of obesity. Bull. N.Y. Acad. Sci. **36:** 286–295.
57. BRAIN, R. 1979. The Decorated Body. Harper & Row. New York.
58. AMNAR, H. 1954. Growing Up in an Egyptian Village. Routledge & Kegan Paul. London.
59. BEAGLEHOLE, E. & P. BEAGLEHOLE. 1938. Ethnology of Pukapuka. Bernice P. Bishop Museum. Honolulu, HA.

60. STRAHERN, A. 1971. The Rope of Moka. Cambridge University Press. New York.
61. GIFFORD, E. W. 1929. Tongan Society. Bernice P. Bishop Mus. Bull. 61. Honolulu, HA.
62. RICHARDS, A. I. 1939. Land, Labour and Diet in Northern Rhodesia: an Economic Study of the Bemba Tribe. Oxford University Press. London.
63. MASSARA, E. B. 1979. Que gordita! a study of weight among women in a Puerto Rican community. Ph.D. dissertation. Bryn Mawr College. Philadelphia, PA.
64. MASSARA, E. B. 1980. Obesity and cultural weight evaluations. Appetite 1: 291–298.
65. STYLES, M. H. 1980. Soul, black women and food. *In* A Woman's Conflict: The Special Relationship between Women and Food. J. R. Kaplan, Ed. Prentice Hall. Englewood Cliffs, N.J.
66. GARNER, D. M., P. E. GARFINKEL, D. SCHWARTZ & M. THOMPSON. 1980. Cultural expectations of thinness in women. Psychol. Rep. 47: 483–491.
67. FALLON, A. E. & P. ROZIN. 1985. Sex differences in perceptions of desirable body shape. J. Abnorm. Psychol. 94: 102–105.
68. Physician Task Force on Hunger in America. 1985. Hunger in America: the Growing Epidemic. Harvard University School of Public Health. Boston, MA.